In the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Currently Amended) A lighting device comprising:

a light guide plate;

a light guide disposed along a side end surface of the light guide plate; and

a light emitting device disposed on an end surface of the light guide,

wherein a plurality of wedge-shaped grooves seen in cross section extending in a thickness direction of the light guide is formed and arranged in a backside of the light guide on an opposite side of the light guide plate,

a metal reflective film is formed on a side surface of the light guide,

in a distribution of a pitch between the grooves with respect to a distance from the end surface disposed with the light emitting device to groove, the pitch between the grooves is linearly varied with respect to the distance from the end surface disposed with the light emitting device to the groove,

a depth of the groove is formed more deeply as the groove is positioned more distal from the end surface, ~~and~~

in a distribution of the depth of the groove with respect to the distance from the end surface disposed with the light emitting device to the groove, there are a first area where the depth of the groove is linearly increased with respect to the distance from the end surface to the groove, and a second area formed more distal from the light emitting device than the first area in which an increasing rate of the depth of the groove with respect to the distance from the end surface is greater than that in the first area, and

in two grooves adjacent to each other formed in at least one of the first and second area, a ratio of the depth of the groove formed on a side apart from the end surface to the depth of the other groove ranges from 1 to 1.005.

2. (Original) The lighting device according to claim 1, wherein in two grooves adjacent to each other formed in the first area, a ratio of the depth of the groove formed on a side apart from the end surface to the depth of the other groove ranges from 1 to 1.005.

3. (Original) The lighting device according to claim 1, wherein in two grooves adjacent to each other formed in the second area, a ratio of the depth of the groove formed on a side apart from the end surface to the depth of the other groove ranges from 1.005 to 1.015.

4. (Original) The lighting device according to claim 1, wherein in the first area, a distance x (mm) from the end surface disposed with the light emitting device and a depth y (μm) of the groove at a position thereof satisfy expression $y = a_1x + b_1$, where a_1 is larger than 0 and less than 0.5, and b_1 ranges from 8.0 to 20.

5. (Original) The lighting device according to claim 1, wherein in the second area, the depth of the groove is given by a quadratic function, cubic function or exponential function of the groove and the distance from the groove to the end surface disposed with the light emitting device.

6. (Previously Presented) The lighting device according to claim 5, wherein the distance from a position of an end of the second area on the light emitting device side to the end surface disposed with the light emitting device is smaller than two-thirds of an overall length of the intermediate light guide, and

a depth y (μm) of the groove and a distance x (mm) from the groove to the end surface disposed with the light emitting device satisfy expression $y = a_2x^2 + b_2$, where a_2 ranges from 0.010 to 0.024, and b_2 ranges from -20 to 13.

7. (Previously Presented) The lighting device according to claim 5, wherein the distance from a position of an end of the second area on the light emitting device side to the end surface disposed with the light emitting device is smaller than two-thirds of an overall length of the intermediate light guide, and

a depth y (μm) of the groove and a distance x (mm) from the groove to the end surface disposed with the light emitting device satisfy expression $y = a_3x^2 + b_3x + c_3$, where a_3 ranges from 0.050 to 0.080, b_3 ranges from -5.7 to -3.7, and c_3 ranges from 50 to 130.

8. (Original) The lighting device according to claim 5, wherein in the first area and the second area, a depth y (μm) of the groove and a distance x (mm) from the groove to the end surface disposed with the light emitting device satisfy expression $y = a_4x^3 + b_4x^2 + c_4x + d_4$, where a_4 ranges from 0.55 to 0.85, b_4 ranges from -0.055 to -0.026, c_4 ranges from 0.3 to 1.5, and d_4 ranges from 8.0 to 20.

9. (Previously Presented) The lighting device according to claim 1, wherein in the distribution of the depth of the groove with respect to the distance from the end surface disposed with the light emitting device to the groove, there is a third area where the depth of the groove is constant irrespective of the distance from the end surface to the groove, and

the third area is formed at a position more distal from the light emitting device than the first area and the second area.

10. (Original) The lighting device according to claim 1, wherein a width of the light guide is 4 mm or greater, and

the pitch between the grooves is formed to be constant irrespective of the distance from the end surface disposed with the light emitting device or formed wider in accordance with the distance from the end surface.

11. (Previously Presented) The lighting device according to claim 10, wherein a pitch z (μm) of the groove and a distance x (mm) from the end surface disposed with the light emitting device satisfy expression $z = a_5x + b_5$, where a_5 is larger than 0 and less than 14, and b_5 ranges from 180 to 250.

12. (Original) The lighting device according to claim 1, wherein a width of the light guide is below 4 mm, and

the pitch between the grooves is formed narrower in accordance with the distance from the end surface disposed with the light emitting device.

13. (Original) The lighting device according to claim 12, wherein a pitch z (μm) of the groove and a distance x (mm) from the end surface disposed with the light emitting device satisfy expression $z = a_6x + b_6$, where a_6 ranges from -14 to 0, and b_6 ranges from 280 to 350.

14. (Original) The lighting device according to claim 1, wherein the groove is formed into an isosceles triangle seen in cross section, and a vertex angle thereof is formed ranging from an angle of 95 to 120 degrees.

15. (Original) A liquid crystal display device comprising:

the lighting device according to claim 1; and

a liquid crystal panel.

16. (New) A lighting device comprising:

a light guide plate;

a light guide disposed along a side end surface of the light guide plate; and

a light emitting device disposed on an end surface of the light guide,

wherein a plurality of wedge-shaped grooves seen in cross section extending in a thickness direction of the light guide is formed and arranged in a backside of the light guide on an opposite side of the light guide plate,

a metal reflective film is formed on a side surface of the light guide,

in a distribution of a pitch between the grooves with respect to a distance from the end surface disposed with the light emitting device to groove, the pitch between the grooves is linearly varied with respect to the distance from the end surface disposed with the light emitting device to the groove,

a depth of the groove is formed more deeply as the groove is positioned more distal from the end surface,

in a distribution of the depth of the groove with respect to the distance from the end surface disposed with the light emitting device to the groove, there are a

first area where the depth of the groove is linearly increased with respect to the distance from the end surface to the groove, and a second area formed more distal from the light emitting device than the first area in which an increasing rate of the depth of the groove with respect to the distance from the end surface is greater than that in the first area, and

in the first area, a distance x (mm) from the end surface disposed with the light emitting device and a depth y (μm) of the groove at a position thereof satisfy expression $y = a_1x + b_1$, where a_1 is larger than 0 and less than 0.5, and b_1 ranges from 8.0 to 20.

17. (New) A lighting device comprising:

a light guide plate;

a light guide disposed along a side end surface of the light guide plate; and

a light emitting device disposed on an end surface of the light guide,

wherein a plurality of wedge-shaped grooves seen in cross section extending in a thickness direction of the light guide is formed and arranged in a backside of the light guide on an opposite side of the light guide plate,

a metal reflective film is formed on a side surface of the light guide,

in a distribution of a pitch between the grooves with respect to a distance from the end surface disposed with the light emitting device to groove, the pitch between the grooves is linearly varied with respect to the distance from the end surface disposed with the light emitting device to the groove,

a depth of the groove is formed more deeply as the groove is positioned more distal from the end surface,

in a distribution of the depth of the groove with respect to the distance from the end surface disposed with the light emitting device to the groove, there are a first area where the depth of the groove is linearly increased with respect to the distance from the end surface to the groove, and a second area formed more distal from the light emitting device than the first area in which an increasing rate of the depth of the groove with respect to the distance from the end surface is greater than that in the first area,

in the second area, the depth of the groove is given by a quadratic function, cubic function or exponential function of the groove and the distance from the groove to the end surface disposed with the light emitting device,

the distance from a position of an end of the second area on the light emitting device side to the end surface disposed with the light emitting device is smaller than two-thirds of an overall length of the intermediate light guide, and

a depth y (μm) of the groove and a distance x (mm) from the groove to the end surface disposed with the light emitting device satisfy expression $y = a_2x^2 + b_2$ or $y = a_3x^2 + b_3x + c_3$ or $y = a_4x^3 + b_4x^2 + c_4x + d_4$ where a_2 ranges from 0.010 to 0.024, b_2 ranges from -20 to 13, a_3 ranges from 0.050 to 0.080, b_3 ranges from -5.7 to -3.7, c_3 ranges from 50 to 130, a_4 ranges from 0.55 to 0.85, b_4 ranges from -0.055 to -0.026, c_4 ranges from 0.3 to 1.5, and d_4 ranges from 8.0 to 20.

18. (New) A lighting device comprising:

a light guide plate;

a light guide disposed along a side end surface of the light guide plate; and

a light emitting device disposed on an end surface of the light guide,

wherein a plurality of wedge-shaped grooves seen in cross section extending in a thickness direction of the light guide is formed and arranged in a backside of the light guide on an opposite side of the light guide plate,

a metal reflective film is formed on a side surface of the light guide,

in a distribution of a pitch between the grooves with respect to a distance from the end surface disposed with the light emitting device to groove, the pitch between the grooves is linearly varied with respect to the distance from the end surface disposed with the light emitting device to the groove,

a depth of the groove is formed more deeply as the groove is positioned more distal from the end surface,

in a distribution of the depth of the groove with respect to the distance from the end surface disposed with the light emitting device to the groove, there are a first area where the depth of the groove is linearly increased with respect to the distance

from the end surface to the groove, and a second area formed more distal from the light emitting device than the first area in which an increasing rate of the depth of the groove with respect to the distance from the end surface is greater than that in the first area,

in the second area, the depth of the groove is given by a quadratic function, cubic function or exponential function of the groove and the distance from the groove to the end surface disposed with the light emitting device,

in the distribution of the depth of the groove with respect to the distance from the end surface disposed with the light emitting device to the groove, there is a third area where the depth of the groove is constant irrespective of the distance from the end surface to the groove, and

the third area is formed at a position more distal from the light emitting device than the first area and the second area.

19. (New) A lighting device comprising:

a light guide plate;

a light guide disposed along a side end surface of the light guide plate; and

a light emitting device disposed on an end surface of the light guide,

wherein a plurality of wedge-shaped grooves seen in cross section extending in a thickness direction of the light guide is formed and arranged in a backside of the light guide on an opposite side of the light guide plate,

a metal reflective film is formed on a side surface of the light guide,

in a distribution of a pitch between the grooves with respect to a distance from the end surface disposed with the light emitting device to groove, the pitch between the grooves is linearly varied with respect to the distance from the end surface disposed with the light emitting device to the groove,

a depth of the groove is formed more deeply as the groove is positioned more distal from the end surface,

in a distribution of the depth of the groove with respect to the distance from the end surface disposed with the light emitting device to the groove, there are a first area where the depth of the groove is linearly increased with respect to the distance

from the end surface to the groove, and a second area formed more distal from the light emitting device than the first area in which an increasing rate of the depth of the groove with respect to the distance from the end surface is greater than that in the first area,

in the second area, the depth of the groove is given by a quadratic function, cubic function or exponential function of the groove and the distance from the groove to the end surface disposed with the light emitting device,

a width of the light guide is 4 mm or greater, and

the pitch between the grooves is formed to be constant irrespective of the distance from the end surface disposed with the light emitting device or formed wider in accordance with the distance from the end surface.

20. (New) The lighting device according to claim 19, wherein a pitch z (μm) of the groove and a distance x (mm) from the end surface disposed with the light emitting device satisfy expression $z = a_5x + b_5$, where a_5 is larger than 0 and less than 14, and b_5 ranges from 180 to 250.

21. (New) A lighting device comprising:

a light guide plate;

a light guide disposed along a side end surface of the light guide plate; and

a light emitting device disposed on an end surface of the light guide,

wherein a plurality of wedge-shaped grooves seen in cross section extending in a thickness direction of the light guide is formed and arranged in a backside of the light guide on an opposite side of the light guide plate,

a metal reflective film is formed on a side surface of the light guide,

in a distribution of a pitch between the grooves with respect to a distance from the end surface disposed with the light emitting device to groove, the pitch between the grooves is linearly varied with respect to the distance from the end surface disposed with the light emitting device to the groove,

a depth of the groove is formed more deeply as the groove is positioned more distal from the end surface,

in a distribution of the depth of the groove with respect to the distance from the end surface disposed with the light emitting device to the groove, there are a first area where the depth of the groove is linearly increased with respect to the distance from the end surface to the groove, and a second area formed more distal from the light emitting device than the first area in which an increasing rate of the depth of the groove with respect to the distance from the end surface is greater than that in the first area,

in the second area, the depth of the groove is given by a quadratic function, cubic function or exponential function of the groove and the distance from the groove to the end surface disposed with the light emitting device,

a width of the light guide is below 4 mm, and

the pitch between the grooves is formed narrower in accordance with the distance from the end surface disposed with the light emitting device.

22. (New) The lighting device according to claim 21, wherein a pitch z (μm) of the groove and a distance x (mm) from the end surface disposed with the light emitting device satisfy expression $z = a_6x + b_6$, where a_6 ranges from -14 to 0, and b_6 ranges from 280 to 350.

23. (New) A lighting device comprising:

a light guide plate;

a light guide disposed along a side end surface of the light guide plate; and

a light emitting device disposed on an end surface of the light guide,

wherein a plurality of wedge-shaped grooves seen in cross section extending in a thickness direction of the light guide is formed and arranged in a backside of the light guide on an opposite side of the light guide plate,

a metal reflective film is formed on a side surface of the light guide,

in a distribution of a pitch between the grooves with respect to a distance from the end surface disposed with the light emitting device to groove, the pitch between the grooves is linearly varied with respect to the distance from the end surface disposed with the light emitting device to the groove,

a depth of the groove is formed more deeply as the groove is positioned more distal from the end surface,

in a distribution of the depth of the groove with respect to the distance from the end surface disposed with the light emitting device to the groove, there are a first area where the depth of the groove is linearly increased with respect to the distance from the end surface to the groove, and a second area formed more distal from the light emitting device than the first area in which an increasing rate of the depth of the groove with respect to the distance from the end surface is greater than that in the first area,

in the second area, the depth of the groove is given by a quadratic function, cubic function or exponential function of the groove and the distance from the groove to the end surface disposed with the light emitting device, and

the groove is formed into an isosceles triangle seen in cross section, and a vertex angle thereof is formed ranging from an angle of 95 to 120 degrees.